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Vehicle Telematics; A Learning Studio for Vehicle Designers.

EADIS: European Automotive Digital Interaction Studio.

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ABSTRACT

Vehicle Telematics is a growth field and is transforming the transport sector. EADIS is a two year international initiative funded by Leonardo Da Vinci UK. It involves five European automotive and design-related educational institutions who have developed an internationally available online training programme that shares knowledge about telematics.

This paper scopes the opportunity to bring together the complexity that the combination of automotive design, telematics innovation, sustainability and user centred design presents. A better understanding of this complexity and potential solutions would allow automotive designers to develop transformational innovations with telematics as an integral part of their designs.

KEYWORDS, vehicle telematics, automotive design, telematics innovation, sustainability and user centred design.

Introduction

As part of the European Commission's Lifelong Learning Programme, Leonardo Da Vinci an internationally funded collaborative initiave was formed in Late 2008. The name given to this European Automotive Digital Interaction Suite (EADIS) is an internationally focused collaborative initiative which is part of the

It aims to support national training strategies by funding a range of transnational partnership projects aimed at improving quality, fostering innovation and promoting the European dimension in vocational training. EADIS was awarded 400,000 Euros to bring together five automotive and design-related educational institutions from across Europe to develop a knowledge map for vehicle telematics and an internationally accessable virtual learning environment (VLE) in the form of an online training programme. It aims to promote a multi-disciplinary awareness of telematics technologies, systems and their appropriate and innovative integration and application. This VLE is known as the Digital Innovation Studio (DIS) and will be used to train and develop professional designers in the automotive industry [1].

The five partners include: Coventry University (CEPAD – Centre for Excellence in Product and Automotive Design), UK; Oulu University of Applied Sciences, Finland; Munster University of Applied Sciences, Germany; Turin Polytechnic, Italy; and, Technical University of Delft in the Netherlands [2]. The team have diverse and complementary specialisms ranging from: e-learning and the technological development of online learning environments and content; programming; automotive design and industry liaison; industry connections and project management. All have a common interest in promoting vehicle telematics awareness. Importantly, the project is also supported by an advisory panel made up of industry representatives including Tom-Tom, FIAT, BMW, MIRA, The Where Business & TNO. This panel helps to evaluate and advise on the development of the VLE content.

This paper scopes the opportunity to bring together the fields of complexity that the combination of automotive design, telematics innovation, sustainability and user centred design presents. A better understanding of this complexity and potential solutions would allow automotive designers to develop transformational innovations with telematics as an integral part of their designs.

Automotive design

One of the main aims of EADIS is to provide support to automotive designers to help them to continue being part of the solution for a number of societal issues such as congestion and climate change. It is the climate change challenge that is the primary focus of this paper. Figure 1 below shows the role of the automotive designer with respect to the involvement to the end user. The model intends to portray the role of both sustainable (or eco-design) and telematics research / innovation in the development of transformational new automotive telematics products and services. The shaded area is generically representative of the realm of the automotive designer. Of note in the model is the often strong links by the designers to the user. This is complimented by subject specific technology research links. What EADIS proposes is that there is a gap with respect to a wide spectrum of telematics and sustainability research.

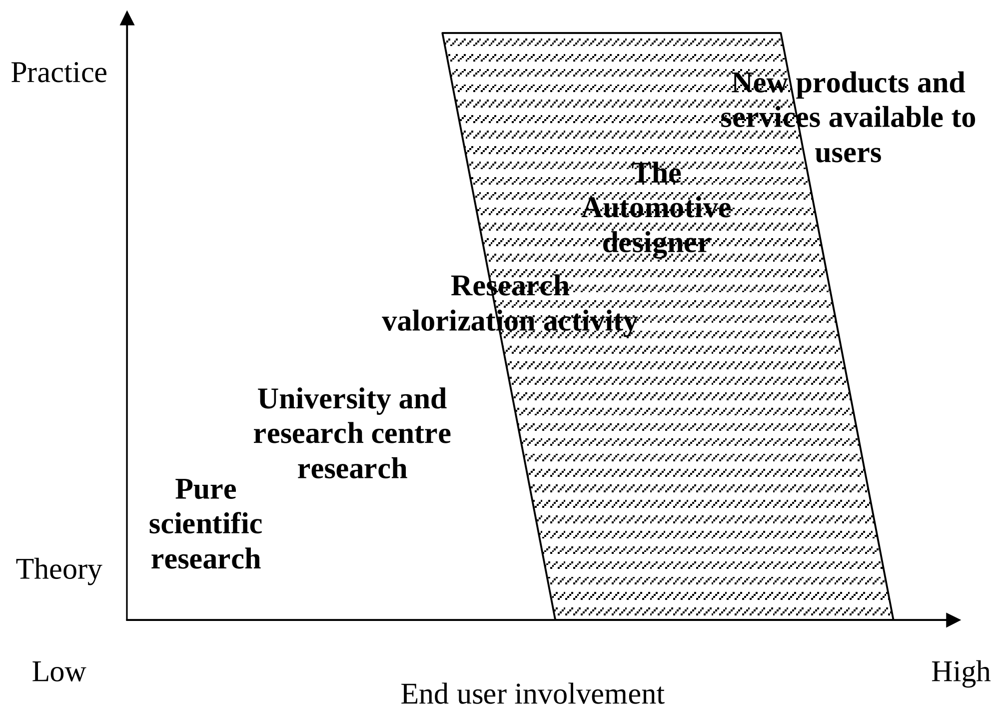

Figure 1. The designers role with respect to the end user.[adapted 3]

The concept of user centred design has driven the automotive designer to consider the involvement with users in new ways. This user-centred approach, (sometimes known as empathic design), puts the automotive designer in direct contact with the end user. A user-centred approach to design helps automotive designers to understand the potential users of the products and services being designed, developing the designers' understanding of users' practical circumstances and their thoughts, values and beliefs. For many years industrial designers have attempted to consider the needs of users during the design process, often to good effect. However as vehicle telematics

purchasers have become more sophisticated in their knowledge and expectations of products, other professionals have been brought onto design teams to bring a greater understanding of psychology and culture. An automotive design team may now involve a range of others who advise designers from their different perspectives:
. Anthropologists; studying the culture and rituals of human groups.
. Ethnographers; studying the behaviour and cultures of people.
. Psychologists; studying the human mind and perceptions.[4]

Automotive Telematics

The field of automotive telematics as identified by EADIS is wide and diverse. Figure 2 identifies the main domains:

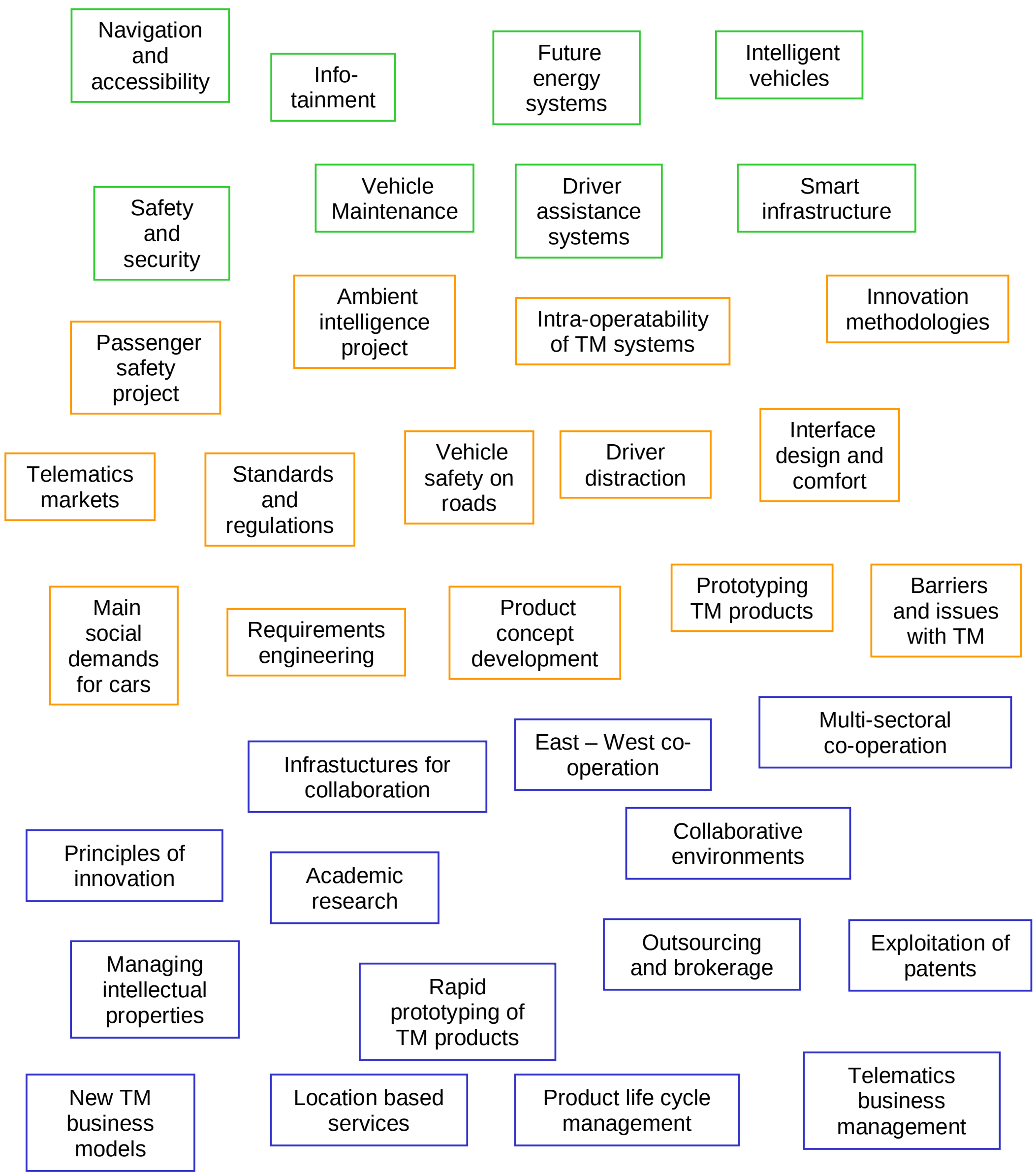

Figure 2. The main domains of automotive telematics

Whilst automotive telematics is principally about the technologies associated with navigation, location, communication and info-tainment the field raises a number of innovation challenges for the automotive designer. These challenges are listed below.

- Privacy – location, movements and data
- Security from data fraud
- Alternative energies
- Cheaper cars – longer life – vehicle systems complexity
- Low carbon footprint
- Robust infrastructure - energy and power supply, reliability and system life span
- De-skilling of driver - MMI & portability.
- Public policy – clarity and acceptance
- Deterioration in social communication
- Vehicle, infrastructure and communication - test facilities are lacking
- Different development cycles of the emerging technologies:
- Technology integration mobile / vehicle and infrastructure

Sustainability

The most widely used definition of sustainability is the one defined by the Brundtland commission in their report Our Common Future (Brundtland, 1987): *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* However, this definition is not directly applicable to product design and innovation. A common way of translating this into more tangible criteria is through the 'triple bottom line' and the 3P approach of People, Planet, Profit - both coined by Elkington in the 1990's (for extensive discussion, see for instance Elkington 1997 [5]). Here the term 'Planet' represents the environmental component, the term 'People' represents the social component and the term 'Profit' represents the economical component. Design for Sustainability is designing products in such a way that they balance these three aspects. Several other authors have further discussed the definition of the term 'sustainability'. For instance, Ehrenfeld (2008) [6] states that: "…sustainability is the possibility that human and other life will flourish on the planet forever."

Sustainable product design integrates environmental, social, and economical considerations of the product's life cycle into the goods and services (Charter & Tischner, 2001). Therefore, sustainable innovation differs from regular innovation by the aim to decrease the negative impacts the product (good and/or service) has on the environmental, social, and economical aspects (ibid). A definition for innovation often varies from one discipline to another and for example engineering and marketing have their own peculiar views as to what is perceived as innovation. According to Garcia & Calantone (2002) [7] the OECD definition from 1991 succinctly captures the essence of innovation from a generic perspective: "innovation is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention".

There are several innovation typologies used to construct innovations and innovativeness (Garcia & Calantone, 2002). For example, Kleinschmidt and Cooper (1991) propose a triadic categorization consisting of low innovativeness, moderate innovativeness, and high innovativeness. Brezet (1998) [8] and Rathenau Institute (1996) have presented a categorization with specifically sustainable innovation in mind. It comprises of four levels: product improvement, product redesign, function innovation, and system innovation. The first two involve product optimization, process improvement, and replacement of components where function innovation changes the product functionally, or includes new products, and system innovation requires technology innovation, or changes to social and structural environment.

Further to this, there is not just one innovation process, but rather a set of different parallel, competing and conflicting processes occurring at the same time (Buijs, 2007) [9]. The innovation process is often presented as a sequence of three different phases: the front-end phase, product development phase, and commercialization phase (Buckler 1997; Koen et al. 2001). During each phase of the innovation process, specific activities are executed to improve the quality of the idea and to let the idea grow (Buijs, 2007). The phases differ in nature and purpose (Koen et al. 2001). Where the front end of the process is often chaotic and unpredictable, the product development phase is more structured, goal oriented and predictable (ibid). Therefore, the different phases of the innovation process need to be addressed differently – with a different set of techniques, tools and human talent.

Design opportunities in automotive design

Leading research by Egil Juliussen, Ph.D. Principal Analyst & Fellow, isuppli [10] has identified the following Eco- automotive approaches as shown in figure 3.

	Approach	Comments
Eco Driving	▶ Information to driver ▶ Efficient acceleration/braking ▶ Recommends speed & gear	▶ Driver behavior focused ▶ 5-15% fuel savings (Navteq) ▶ Navteq: Electronic Horizon SW
Eco Routing	▶ Routing for min fuel usage ▶ Road segment: Fuel use index	▶ Navigation system focused ▶ 5-10% fuel savings (Navteq)
Eco Powertrain	▶ Map attributes to lower fuel use ▶ Low cost: "Map ECU" ▶ Use is 100% and autonomous	▶ Navteq MPE: 2-5% fuel savings ▶ 4GB map, MCU, GPS, gyro ▶ No driver action needed
Eco Hybrid & Electric	▶ Similar to above approach ▶ Extends use of electric motors	▶ Battery recharging focus ▶ Likely future standard

Figure 3. The main areas of automotive telematics

Of note is the potential fuel savings (and therefore CO_2 savings) on a range of available vehicles. Of note is the huge potential with alternative fuels.

Discussion

The challenge comes, however, when one considers the complexity that a combination of automotive design, telematics innovation, sustainability and user centred design presents. This is shown in figure 4.

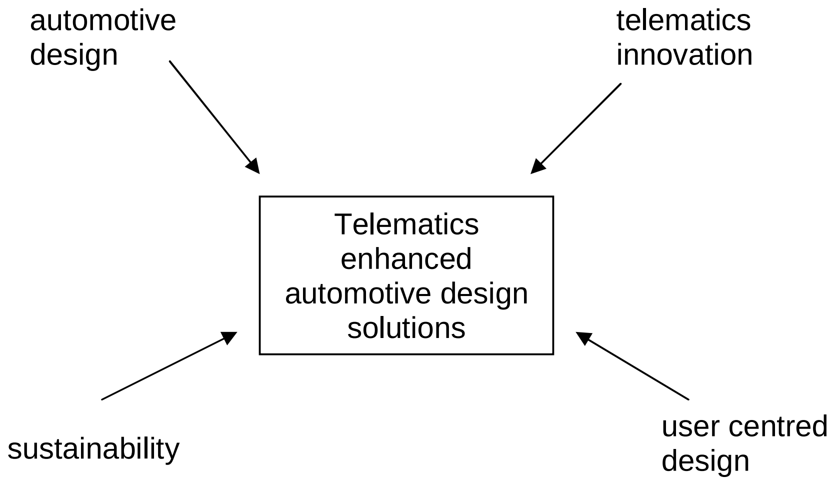

Figure 4. The innovation challenge

One of the key aspects of this challenge is the requirement to engage with a wider range of stakeholders. Some examples of such stakeholder is shown in figure 5.

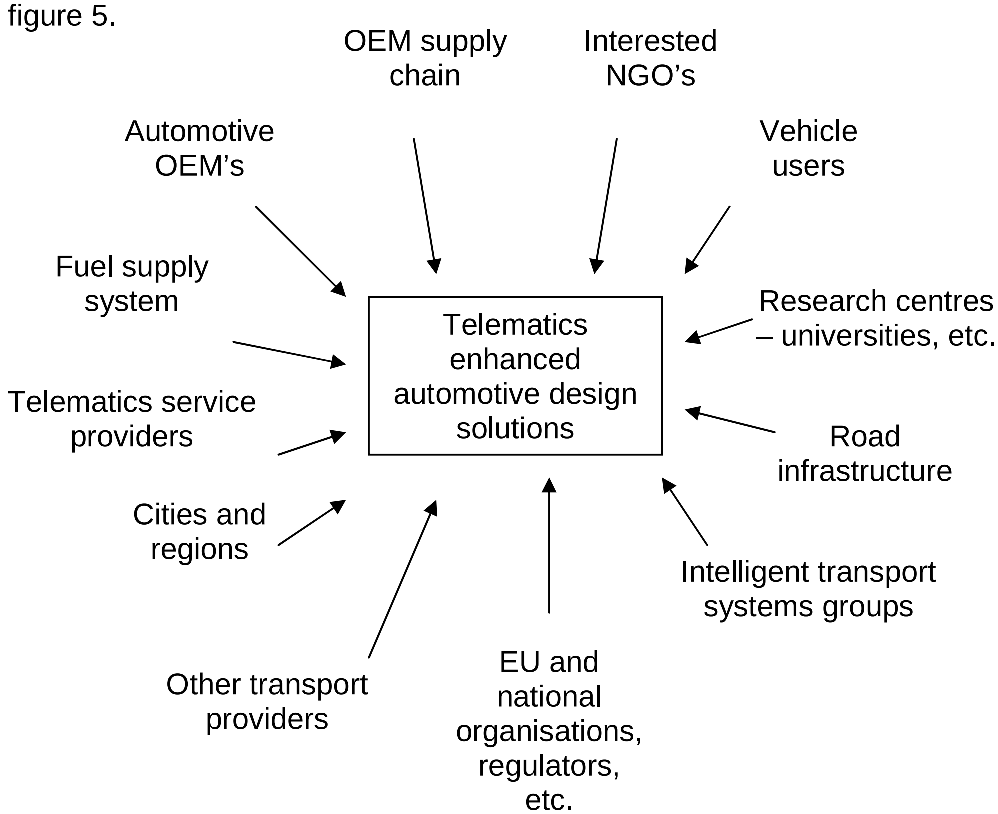

Figure 5. Stakeholders

Conclusions

This paper has explored the wide spectrum presented by the sustainability – telematics – automotive - design field. The focus has been on user centred design, telematics and sustainability and the challenges this represents. The main conclusion is there is a real need for further industry linked research that will bring these demanding and sometimes conflicting subjects together.

Whilst there is good progress being made in the automotive design sector research by EADIS has identified gaps in the skills and knowledge of automotive designers.

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